ACCIDENTAL CENTRAL VENOUS CATHETER PLACEMENT IN THE INTERNAL THORACIC VEIN: A CASE REPORT

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Introduction

Central venous catheter (CVC) placement is an essential component of administering effective critical care, with common indications including vasopressor administration, volume resuscitation, hemodynamic monitoring, blood product administration, parenteral nutrition, and chemotherapy administration. However, it is not without risks. Complications of CVC placement at any site have been reported at rates as high as 15%, and include pneumothorax, hemothorax, nerve injury, arteriovenous fistula formation, catheter fragmentation with subsequent embolization, and catheter malposition.[1] Cannulation of the internal jugular vein (IJV) is generally considered safer compared to the subclavian vein given that it is more readily accessible and more rostral in location (and therefore less likely to cause a pneumothorax).[2] However, the incidence of CVC malposition during IJV cannulation has still been reported around 2-4%.[3,4] This case report describes the rare complication of left internal thoracic vein (ITV; previously known as the internal mammary vein) cannulation. The first documented case of this phenomenon was reported in 1974.[2] Only a handful of similar case reports have since been documented, and guidelines for management are therefore lacking. This report discusses risk factors and warning signs of ITV cannulation, as well as subsequent management to optimize patient safety.

Methods

The case of a 76-year-old female undergoing left IJV catheterization for vasopressor administration was analyzed. Information and images were obtained from IU Health Ball Memorial Hospital's electronic medical record system. The few previously reported cases of left ITV cannulation were reviewed.

Case Summary

A 76-year-old female in the intensive care unit (ICU) for septic shock required vasopressor support, which was initially administered via a right IJV CVC. However, new central access was required after the patient removed the aforementioned CVC during an episode of delirium. Left-sided IJV cannulation was achieved with ultrasound guidance. No resistance was encountered upon guidewire and subsequent catheter introduction to a depth of approximately 17 centimeters (cm). Aspiration through the proximal port was without issue. However, initial aspiration attempts via the medial and distal ports failed. The catheter was then advanced by approximately 2 cm with subsequent successful aspiration through all three ports. Chest X-ray (CXR) revealed the CVC following a vertical course along the left mediastinum, and transducer pressure measurement was consistent with venous placement. A computed tomography (CT) scan confirmed cannulation of the left ITV. Interventional radiology was consulted to place a right-sided IJV catheter since the site had been previously cannulated. After successful placement of the right-sided CVC, the left-sided catheter was then removed without further complications.

Imaging and Figures

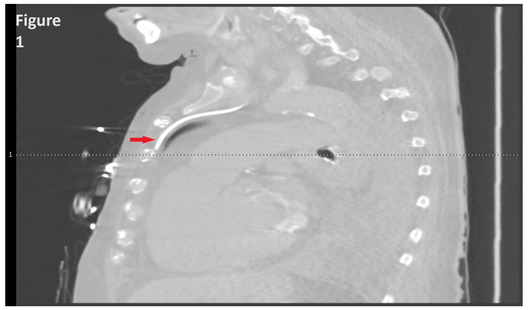

Figure 1. Computed tomography sagittal view of left-sided internal jugular vein central venous catheter (red arrow) coursing along the anterior mediastinum, consistent with placement in the left internal thoracic vein

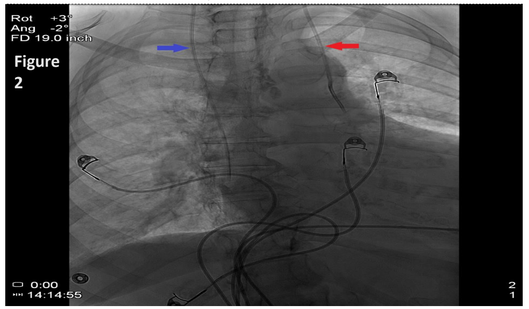

Figure 2. Chest radiograph with right-sided central venous catheter (blue arrow) as well as the malpositioned left-sided catheter in the left internal thoracic vein (red arrow), prior to removal of the latter

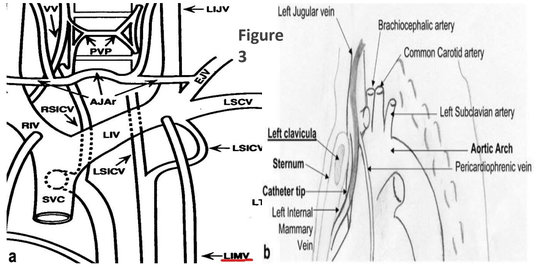

Figure 3. Depictions of front (a) and side (b) views of anatomy surrounding the left internal mammary vein

Discussion

CVC malposition is a known complication of IJV cannulation, occurring at an estimated rate around 2-4%.[3,4] However, cannulation of the ITV is much rarer. The ITV receives the anterior intercostal veins as well as some abdominal branches, eventually draining into the brachiocephalic vein behind the sternal end of the clavicle and first costal cartilage.[4] It therefore makes sense that proposed risk factors for left ITV cannulation include portal hypertension as well as location of a patient's left ITV directly opposite the left IJV orifice.[1,4] In a patient with portal hypertension, blood flow from the portal system is diverted through collateral anastomoses, which in turn increases systemic circulation volume. This results in dilation of small vessels in close proximity to these anastomoses, including the ITV. However, our patient did not have a history of portal hypertension, and more data would be helpful in determining other possible risk factors for ITV cannulation.

Early signs of CVC misplacement include chest pain, guidewire resistance, and, as seen in this case, difficulty aspirating, particularly from the distal port(s).[5,6] Although ultrasound is useful in confirming intraluminal positioning of the guidewire, this case demonstrates that it is not sufficient in confirming catheter tip location.[1] CXR can only approximate catheter position, and prompt CT or CT angiography (CTA) should be strongly considered in these cases to rule out potentially disastrous complications.[3] If extravascular placement or placement in a large, incompressible artery or vein is suspected, discussion with interventional radiology (IR) and/or vascular surgery is recommended. Previous case reports have used fluoroscopy and agitated saline flush tests to confirm that agents administered through an ITV-located catheter would indeed reach the right atrium.[1,4] Considering this, it would follow that a catheter in this site could theoretically be used for medication administration, especially in an emergency where time is of the essence. Indeed, one case report documented using a catheter known to be located in the left ITV for four days without complications.[6] Despite this, it remains the safest course of action to remove the misplaced CVC as soon as it is practical.[3]

Conclusion

CVC cannulation of the ITV is a very rare complication of attempted central venous access via the IJV. Due to the limited ability of CXR to approximate catheter position, prompt CT or CTA should be considered to rule out serious complications when CVC malposition is suspected. Vascular surgery and/or IR consultation may be needed. If confirmation of ITV cannulation is obtained with reasonable certainty, then the CVC should be removed as soon as is practical.

References

Available in hard copy upon request

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